



EPA Region 7 TMDL Review

TMDL ID: KS-UR-14-228-2 **Waterbody ID:** KS-UR-13-228_2, KS-UR-13-228_3, KS-UR-13-228_4, KS-UR-14-W010_2

Waterbody Name: BEAVER CREEK -- DISSOLVED OXYGEN

Tributary: SEE (ENCLOSURE A) FOR TRIBUTARIES COVERED UNDER THIS TMDL

Pollutant: DISSOLVED OXYGEN

State: KS **HUC:** 10250014, 10250013

BASIN:

Submittal Date: 6/30/2006

Approved: Yes

Submittal Letter

State submittal letter indicates final TMDL(s) for specific pollutant(s)/water(s) were adopted by the state, and submitted to EPA for approval under section 303(d) of the Clean Water Act.

Letter, dated June 30, 2006, and received by EPA on June 30, 2006, formally submitted this TMDL for approval under Section 303(d).

Water Quality Standards Attainment

The water body's loading capacity for the applicable pollutant is identified and the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources is described. TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards.

Beaver Creek baseflow is depleted to the degree that flow is seen less than 25% of the time. Point source effluent likely infiltrates through the stream channel rather than flow downstream to the monitoring station. Since the percent exceedance does not have much meaning for displaying the context of the dissolved oxygen levels seen on Beaver Creek, an alternative expression for flow condition was derived. Flows on the date of sampling were divided by the mean daily flow for Beaver Creek (3.4 cfs). This percent of mean flow gives a more accurate perspective of flow distribution on a depleted system (Figure 4). Five of the deficit oxygen situations were well below mean flow, including an extremely low flow in winter. Two springtime deficits occurred with runoff, indicated by large percentages of mean flow. Most good quality situations, indicated by dissolved oxygen levels of 6 mg/l or more occurred with higher flows.

Numeric Target(s)

Submittal describes applicable water quality standards, including beneficial uses, applicable numeric and/or narrative criteria. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, site specific if possible, was developed from a narrative criterion and a description of the process used to derive the target is included in the submittal.

The ultimate endpoint for this TMDL will be to achieve the Kansas Water Quality Standards fully supporting Aquatic Life, indicated by dissolved oxygen concentrations of 5 mg/L or more. The lack of consistent flow will aggravate situations of deficient dissolved oxygen, particularly at flows below mean flow.

Numeric Target(s) and Pollutant(s) of concern

An explanation and analytical basis for expressing the TMDL through surrogate measures (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae) is provided, if applicable. For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and margin of safety that do not exceed the load capacity.

Dissolved oxygen is significantly correlated with streamflow, fluoride and selenium and inversely correlated with ammonia and total phosphorus. Though not significant, dissolved oxygen was also negatively correlated with parameters typically associated with runoff (BOD, fecal coliform, fecal strep and total suspended solids) as well as water temperature.

Source Analysis

Important assumptions made in developing the TMDL, such as assumed distribution of land use in the watershed, population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources, are described. Point, non point and background sources of pollutants of concern are described, including magnitude and location of the sources. Submittal demonstrates all significant sources have been considered.

These limited data indicate that low dissolved oxygen levels on Beaver Creek are typically caused by a combination of low flows, warm water temperatures and some organic material loading into the stream. There are three NPDES permitted dischargers within the Beaver Creek watershed (Figure 1), all of them located in the lower portion of the stream system. None of the facilities contribute enough flow to deliver loads down to the Cedar Bluffs monitoring site (Table 2). The cities have permit limits for BOD in their effluent, (weekly averages of 45 mg/l; monthly averages of 30 mg/l). Atwood averaged 19 mg/l BOD in samples of effluent over 2004-2005. Herndon has not discharged since 2002. Finley Construction does not discharge BOD. Streeter-Phelps modeling indicates the two municipal dischargers do not cause any significant DO sag below 5 mg/l. There are a number of confined animal feeding operations within the watershed, but only four between Atwood and monitoring station. Despite their proximity to the creek, they are certified not to cause significant pollution to the stream except in situations of extreme precipitation events (stream flows associated with such events are typically exceeded only 1% of the time). Such events would not occur at a frequency or of a duration that they would constitute a long-term impairment to the designated uses of the river.

Allocation

Submittal identifies appropriate wasteload allocations for point, and load allocations for nonpoint sources. If no point sources are present the wasteload allocation is zero. If no nonpoint sources are present, the load allocation is zero.

Lack of sufficient dissolved oxygen is caused by a combination of introduction of organic material into Beaver Creek, mostly under warm water temperatures and with insufficient flow to either dilute the organic material or to provide re-aeration to the stream.

WLA Comment

Current Wasteload Allocations will be set for Herndon and Atwood, based on their current permit limits for BOD (30 mg/l) and the design flows of their wastewater treatment facilities. Therefore, Herndon will receive a Wasteload Allocation of 8.8 pounds per day of BOD, while Atwood will receive an allocation of 50 pounds per day. Neither point source with active discharge is seen as a main contributor to the depressed dissolved oxygen seen along Beaver Creek because of the lack of transmission of their effluent through the course of the stream channel to Station 228 and analysis through Streeter-Phelps modeling.

LA Comment

Introduction of organic matter into Beaver Creek from runoff events might be the principal source causing the incidents of low dissolved oxygen. Based on observation of dissolved oxygen problems, a threshold of 3 mg/l for BOD seems an appropriate target since 4 of 6 dissolved oxygen deficits occurred when BOD was above 3 mg/l, while nine of the 11 samples with adequate dissolved oxygen had BOD below 3 mg/l. Using 3 mg/l as the threshold for organic matter loading into the stream, the associated BOD loading will be estimated as 55 pounds per day at mean flow (3.4 cfs).

Margin of Safety

Submittal describes explicit and/or implicit margin of safety for each pollutant. If the MOS is implicit, the conservative assumptions in the analysis for the MOS are described. If the MOS is explicit, the loadings set aside for the MOS are identified and a rationale for selecting the value for the MOS is provided.

The Margin of Safety provides some hedge against the uncertainty of loading and the dissolved oxygen endpoint for the Beaver Creek system and is considered implicit in this TMDL. Relative to point source loading, conservative assumptions are made regarding discharging at design flows in the face of declining service population and discharging at current BOD limits, whereas actual BOD concentrations of effluent are typically less than permitted. The most conservative assumption is the wastewater from either of the two municipalities actually transits a significant distance downstream to the monitoring station, when the true situation is the flow moves vertically more readily than laterally. Relative to non-point sources, the load allocation is made at mean flow, representing a more sustained flow condition on Beaver Creek than what actually occurs with episodic runoff events. Certified animal feeding operations below permitting thresholds will be the focus of implementation for this TMDL with inspection of seasonal use by livestock and manure disposal practices typically large distances away from Beaver Creek. The conservative assumption is that non-point BOD loads actually enter the stream and transit down to the monitoring station.

Seasonal Variation and Critical Conditions

Submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s).

Seasonal variation has been incorporated in this TMDL through the documentation of high dissolved oxygen levels during spring when flows are typically the highest.

Public Participation

Submittal describes public notice and public comment opportunity, and explains how the public comments were considered in the final TMDL(s).

Public meetings to discuss TMDLs in the Upper Republican Basin were held March 2, 2006 in Atwood. An active Internet Web site was established at <http://www.kdheks.gov/tmdlindex.htm> to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Upper Republican Basin. Public Hearing: Public Hearings on the TMDLs of the Upper Republican Basin were held in Atwood on March 2, 2006.

Monitoring Plan for TMDL(s) Under Phased Approach

The TMDL identifies the monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of WQS, and a schedule for considering revisions to the TMDL(s) (where phased approach is used).

KDHE will continue to collect bimonthly samples at Station 228, including DO measurements, in each of the three defined seasons over 2006-2010, provided streamflow is present at the station. Based on that sampling, the stream will be evaluated in 2011 for possible delisting in 2012 and in 2014 if more stringent controls might be necessary.

Reasonable assurance

Reasonable assurance only applies when reductions in nonpoint source loading is required to meet the prescribed waste load allocations.

Streeter-Phelps analysis shows the WLAs to be protective.